

NASA TECH BRIEF

Marshall Space Flight Center



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A Continuous Physiological Data Collector

The problem:

Metabolic rate and energy consumption of a human subject engaged in a specific task in a given environment are measured by an analysis of his exhaled gas. The present equipment used for such measurements is bulky and thus limited to laboratory areas. In addition, measurements are given as an average per work task obtained through lengthy computations of data.

The solution:

A continuous physiological data collector, COP-DAC, has been developed which is compact and gives actual measurements per work task and not the average. This system instantly monitors physiological and metabolic functions and can be used in most environments.

How it's done:

The COP-DAC contains an oxygen and carbon dioxide analyzers, a gas-flow meter, a gas breathe-through system, an analog computer, and a data storage system. During monitoring, a subject exhales through the gas-flow meter by way of the gas breathe-through system. The oxygen and carbon dioxide analyzers are then exposed to the expired gases and convert any changes in O_2 and CO_2 contents into electrical signals. The change in flow is also indicated by an electrical potential change. These signals are then introduced into the analog computer, mixed with pressure-temperature variables and oxygen-BTU constants, and evaluated over real time to give a continuous monitoring of the physiological and metabolic data. The data are displayed on digital voltmeters and incorporated into the data storage system.

In this system, the oxygen analyzer contains an oxygen cell that responds electrochemically to the percentage change in O_2 content of the expired gases. The carbon dioxide analyzer operates on the infrared absorption characteristics of CO_2 . As the CO_2 content

is changed, the infrared energy is changed which is translated into an electrical signal change. The gas flow meter which gives expired gas volume over real time, operates similarly to a bridge circuit. An electrical potential is applied to the expired gas tunnel, and as the volume of gas flows through the tunnel, it cools the surrounding areas, thereby changing the electrical potential.

The entire system can accommodate additional equipment. A number of computers, data storage systems, and display techniques can be incorporated. In addition, other physiological and metabolic functions such as heart rate, blood pressure, etc. can be included. The system can be connected directly to the computer or adapted to rf mode for remote operation.

Notes:

1. COP-DAC is applicable in industry and medicine. The industry can utilize COP-DAC for employee health surveys and to determine their energy requirements for certain tasks. The medical field can use COP-DAC for studies of respiratory diseases as well as for measurements of physiological and respiratory efficiencies.
2. Requests for further information may be directed to:
Technology Utilization Officer
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Reference: B72-10402

Patent status:

No patent action is contemplated by NASA.

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